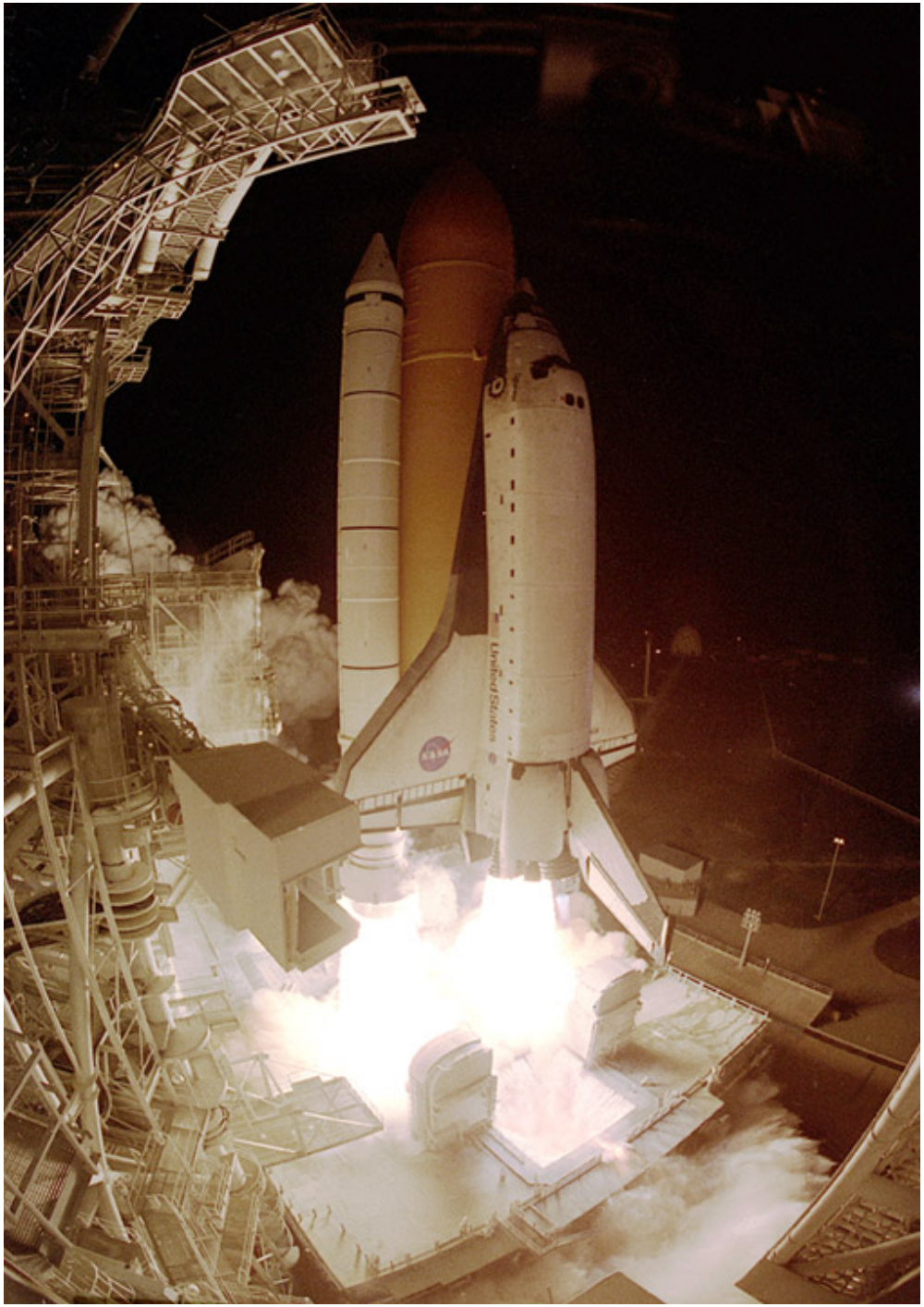
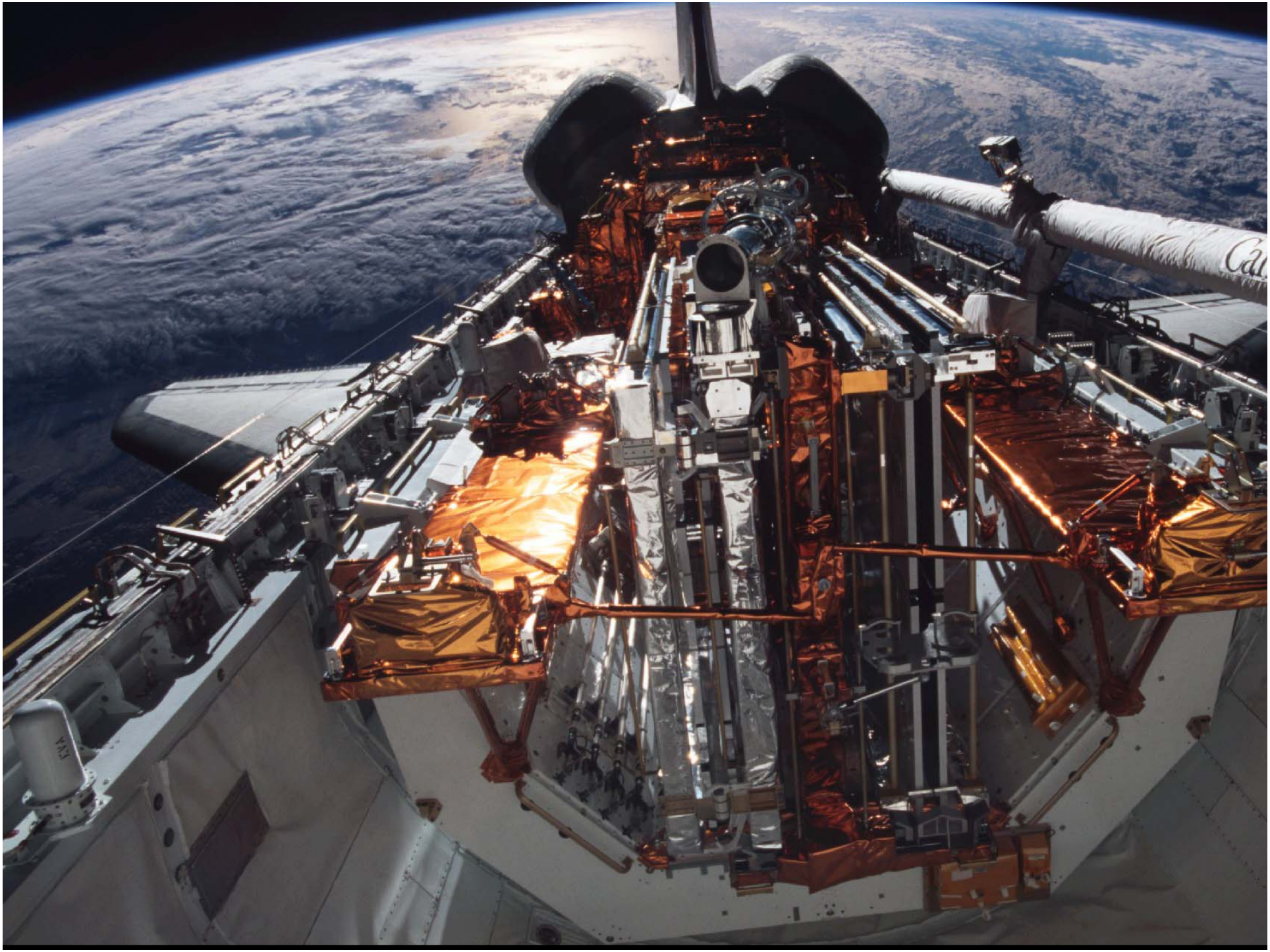
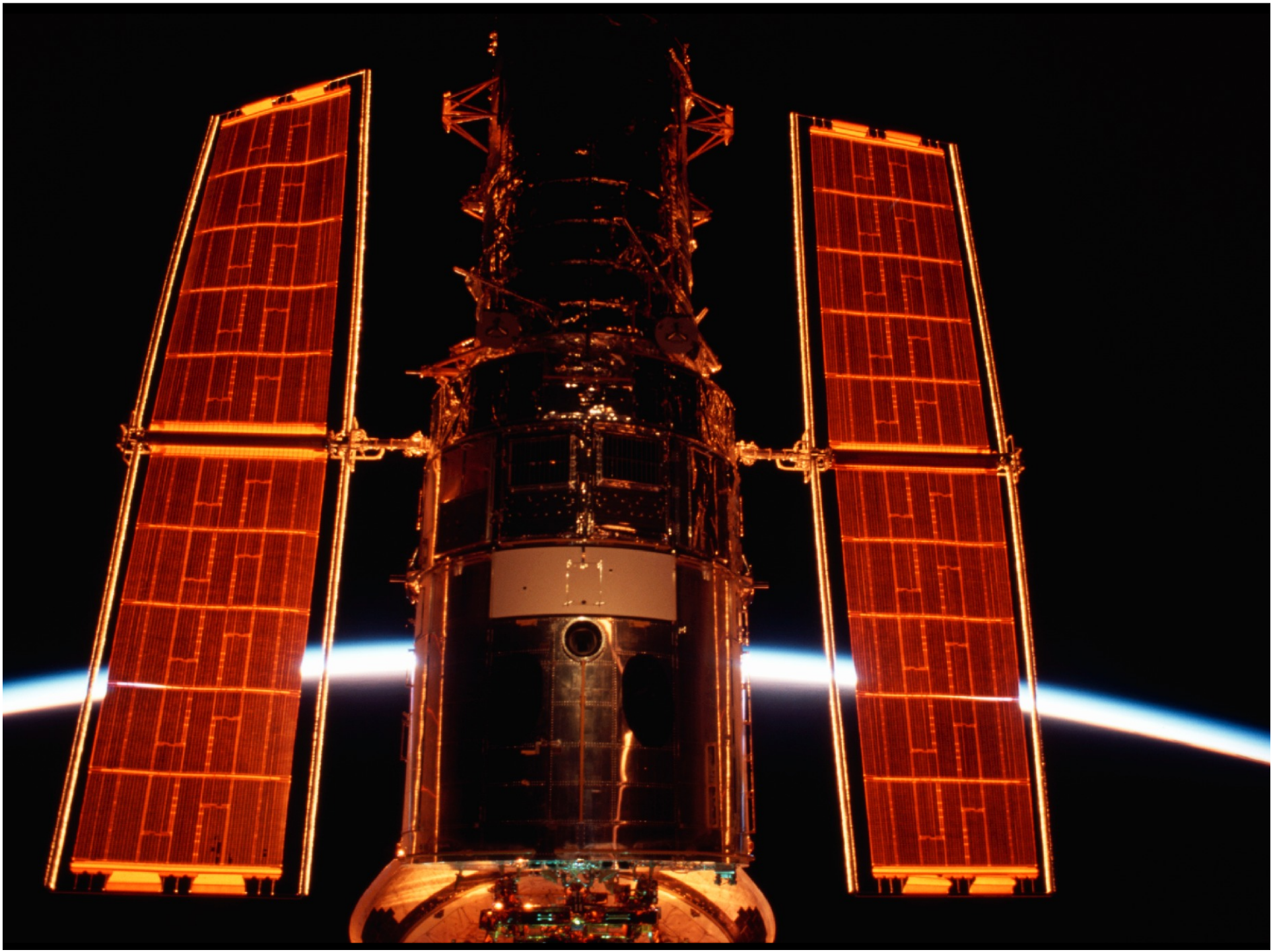
Processing Hubble flight hardware at KSC


United States






MF43G
COMM.

Solar Array change-out on orbit

S109E5462

NCS Radiator installation during EVA Day 5

HOW

BUILD A TEAM OF EXPERTS

EVA engineers

Contamination engineers
Integration and test engineers
Procedures developers
Safety engineers
Structural engineers
Thermal engineers
Tool engineers

Systems engineers

Goddard Space Flight Center (GSFC)

Equipment Engineers and EVA Engineers

engineering development

instruments, tools, carriers

mission support

Johnson Space Center (JSC)

Astronauts

Mission Operations Engineers

astronaut training

mission support

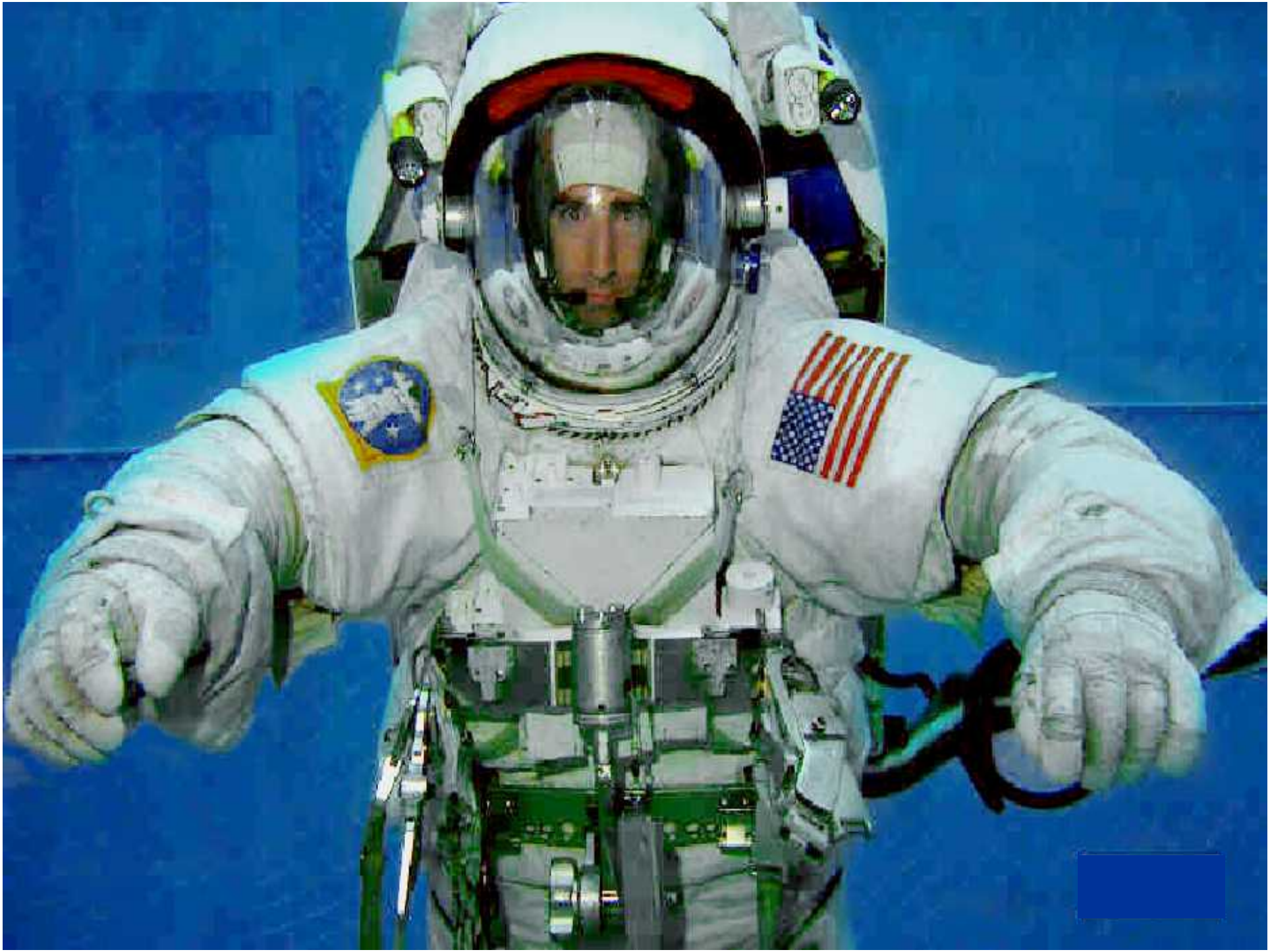
Langley Research Center (LaRC)

Tool development team

with JSC and GSFC for RTF

Kennedy Space Center (KSC)

Launch support



#9

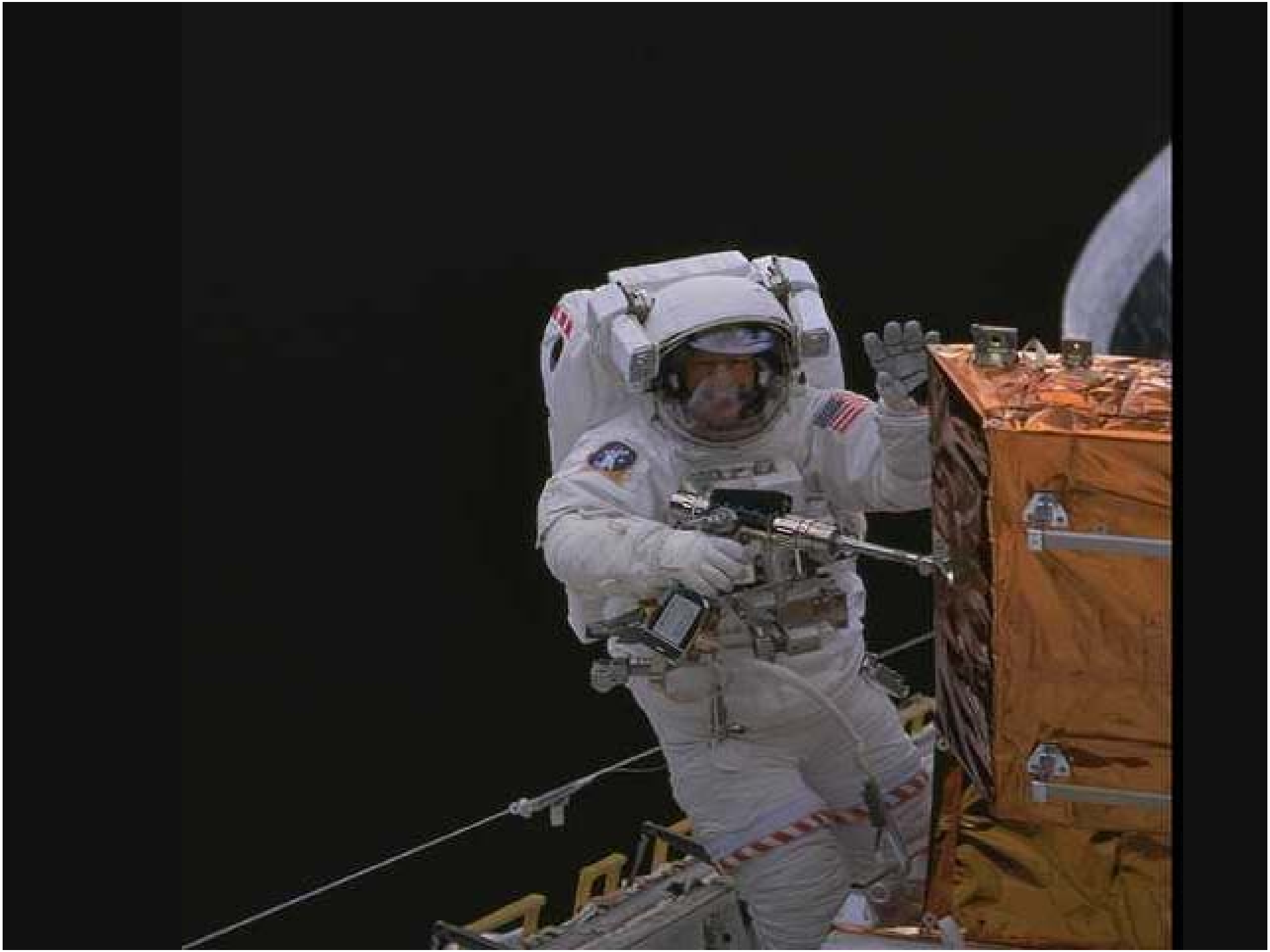
START BY ESTABLISHING REQUIREMENTS

#8

KEEP THE DESIGNS SIMPLE

#7

GET FEEDBACK FROM USERS



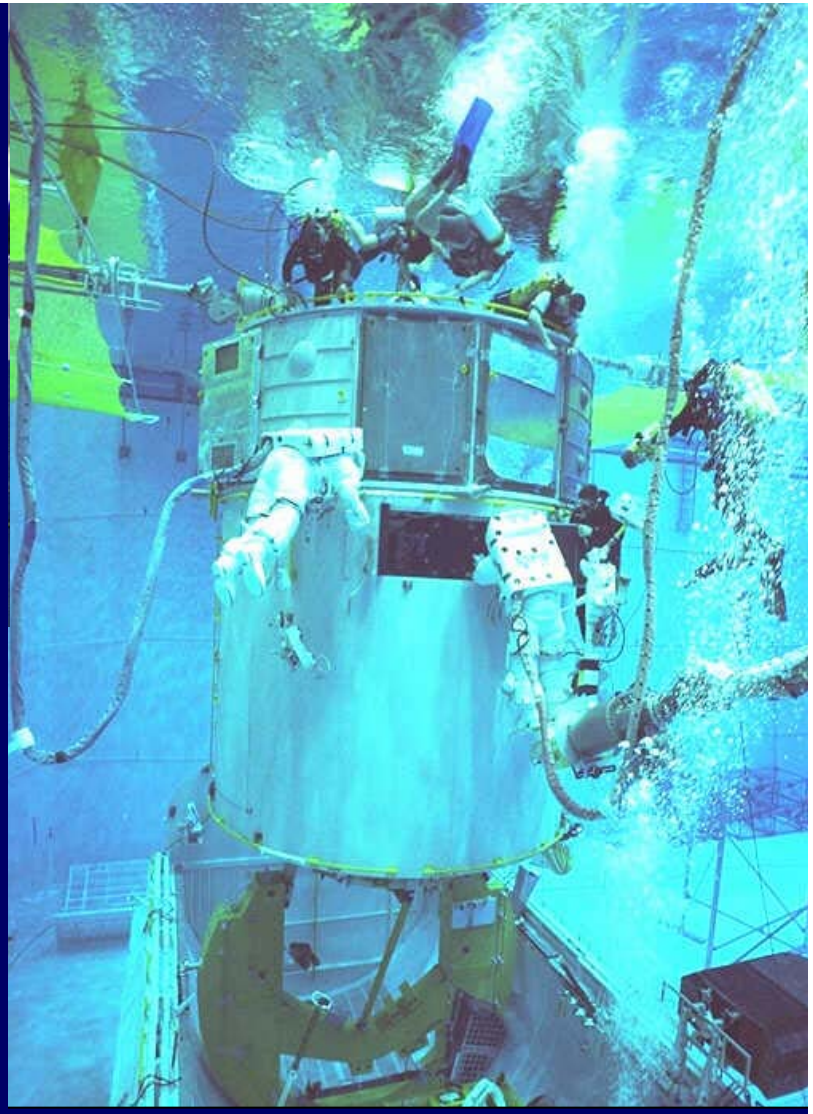
#6

CONTINUALLY ASK "WHAT IF . . .?"

To identify unintended consequences

To develop nominal and contingency hardware and procedures

To reduce mission success risk



#5 USE A VARIETY OF TESTING AND TRAINING METHODS

Neutral buoyancy:

JSC Neutral Buoyancy Laboratory (NBL)

University of Maryland Neutral Buoyancy Research Facility (NBRF)

1-G:

High Fidelity Mechanical Simulator (HFMS)

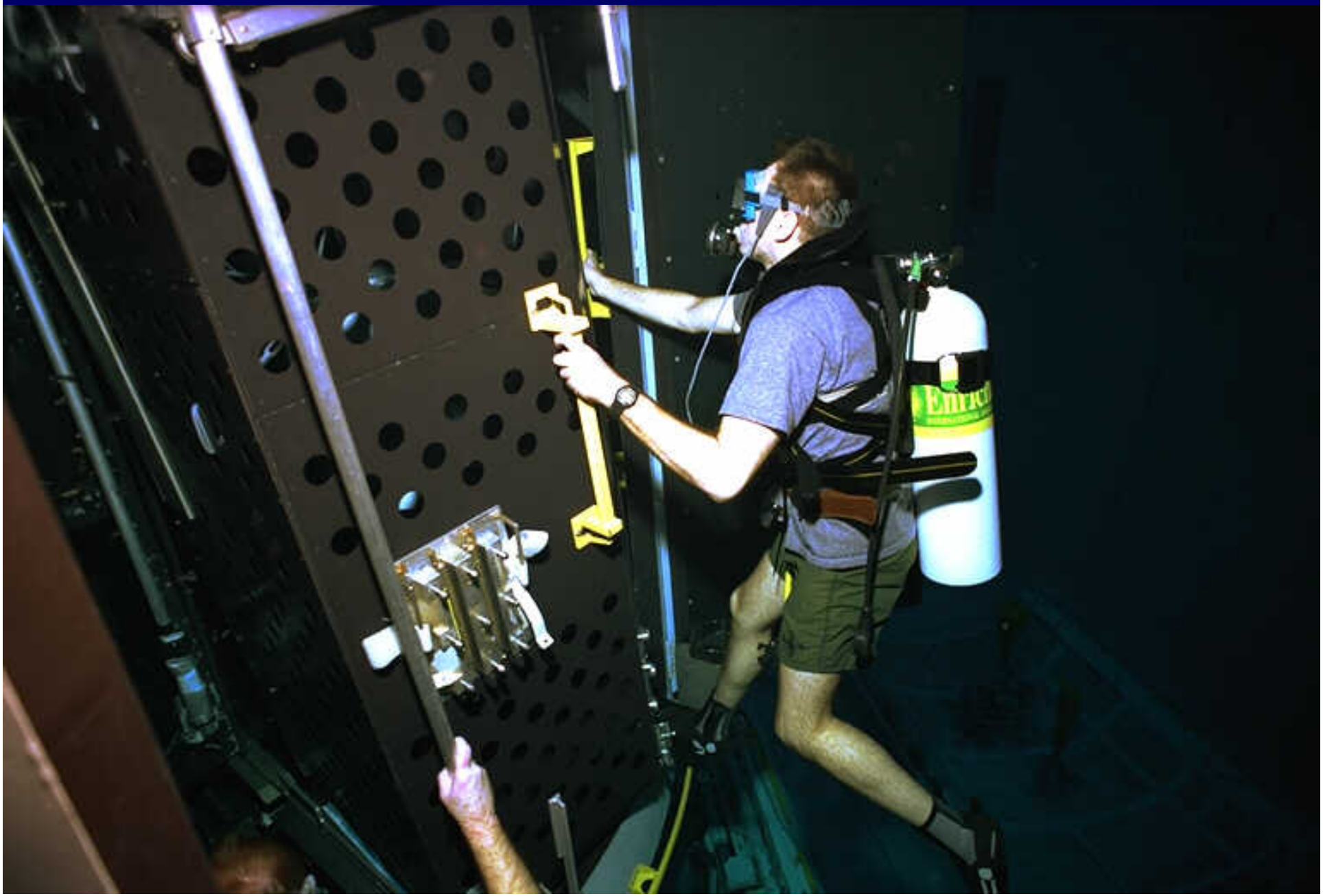
Vehicle Electrical System Test (VEST) Facility

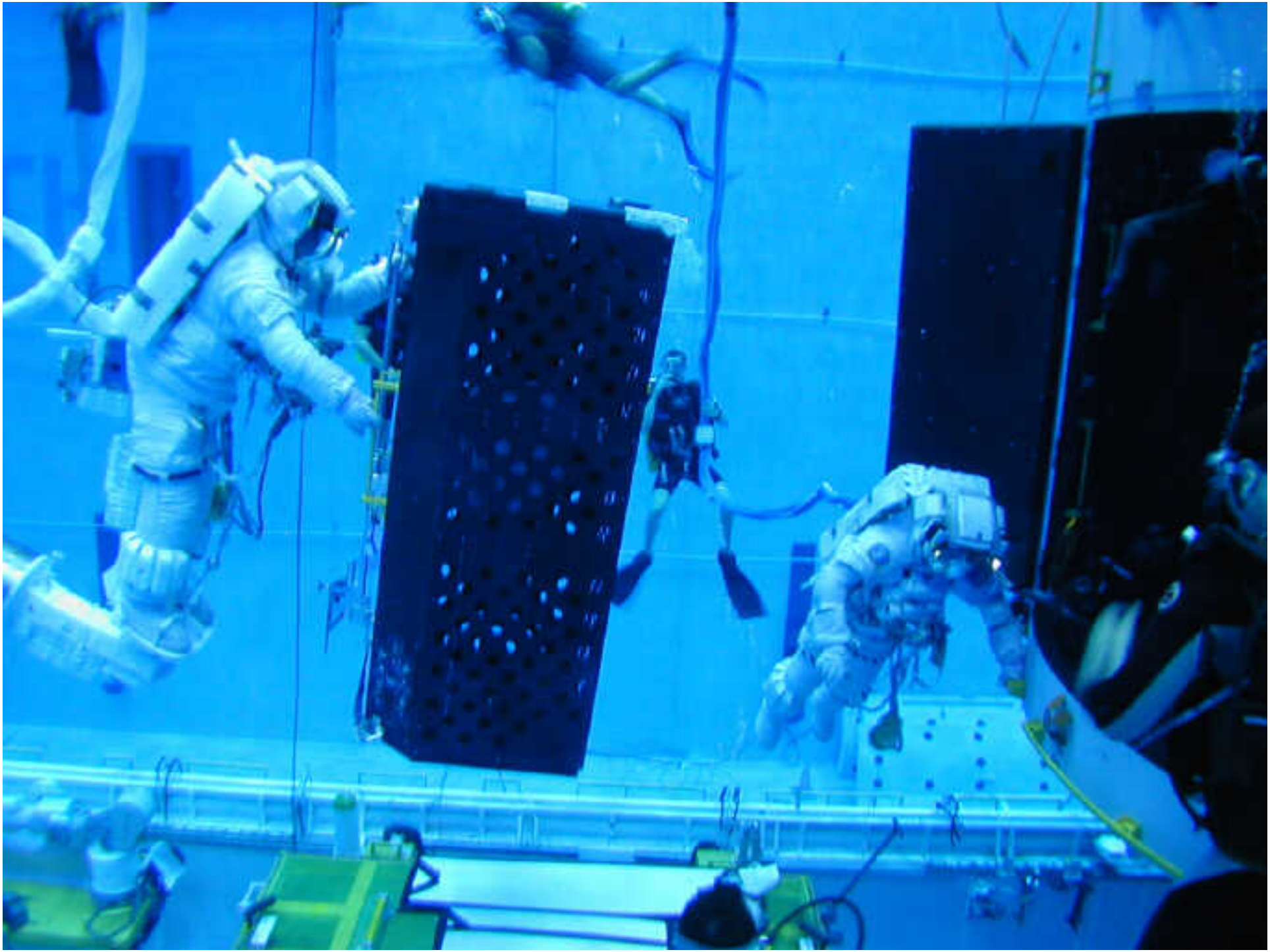
Exterior Simulator Facility (ESF)

Aft Shroud Door Trainer (ASDT)

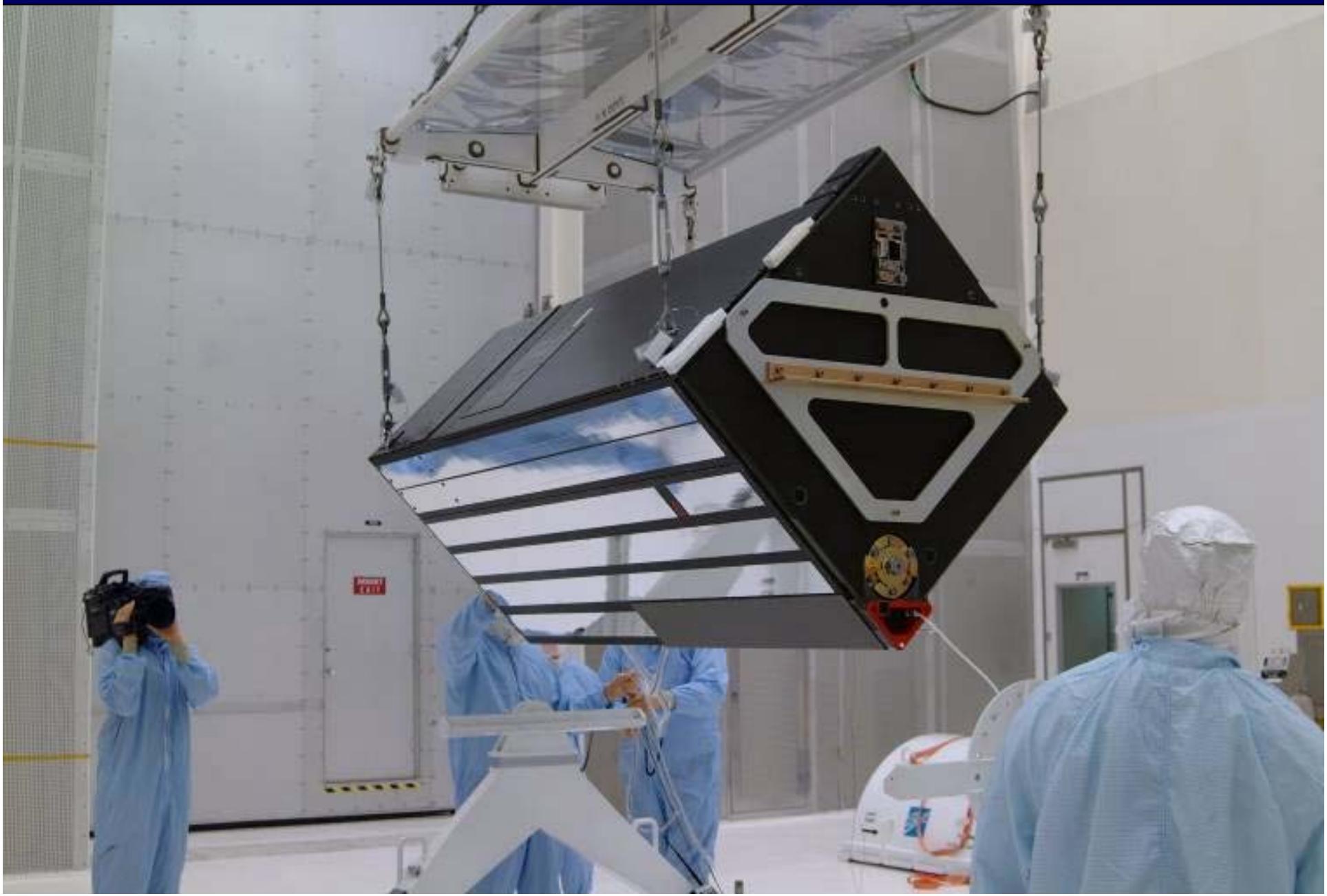
Power Control Unit (PCU) Trainer

Advanced Camera for Surveys (ACS) at NBL

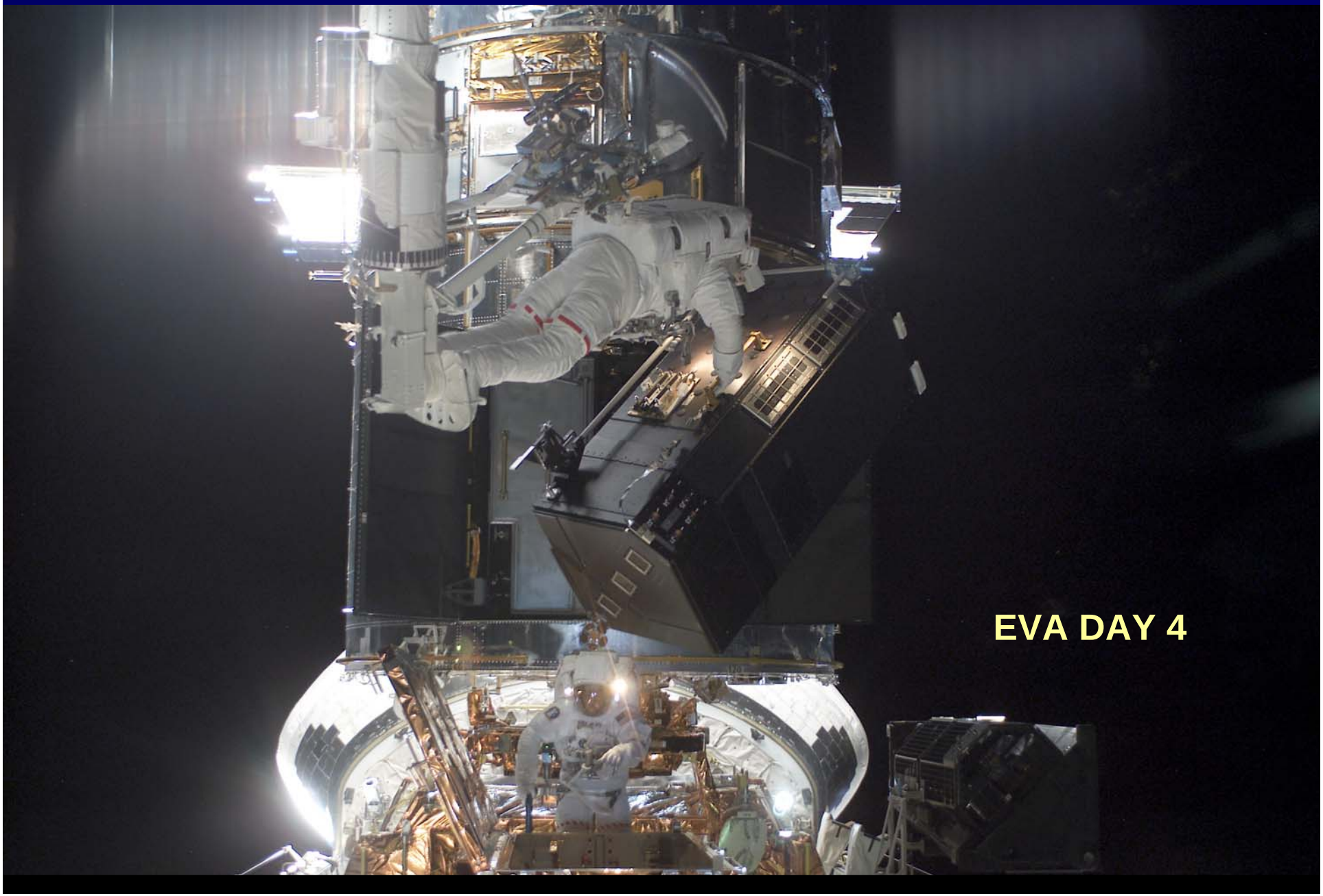


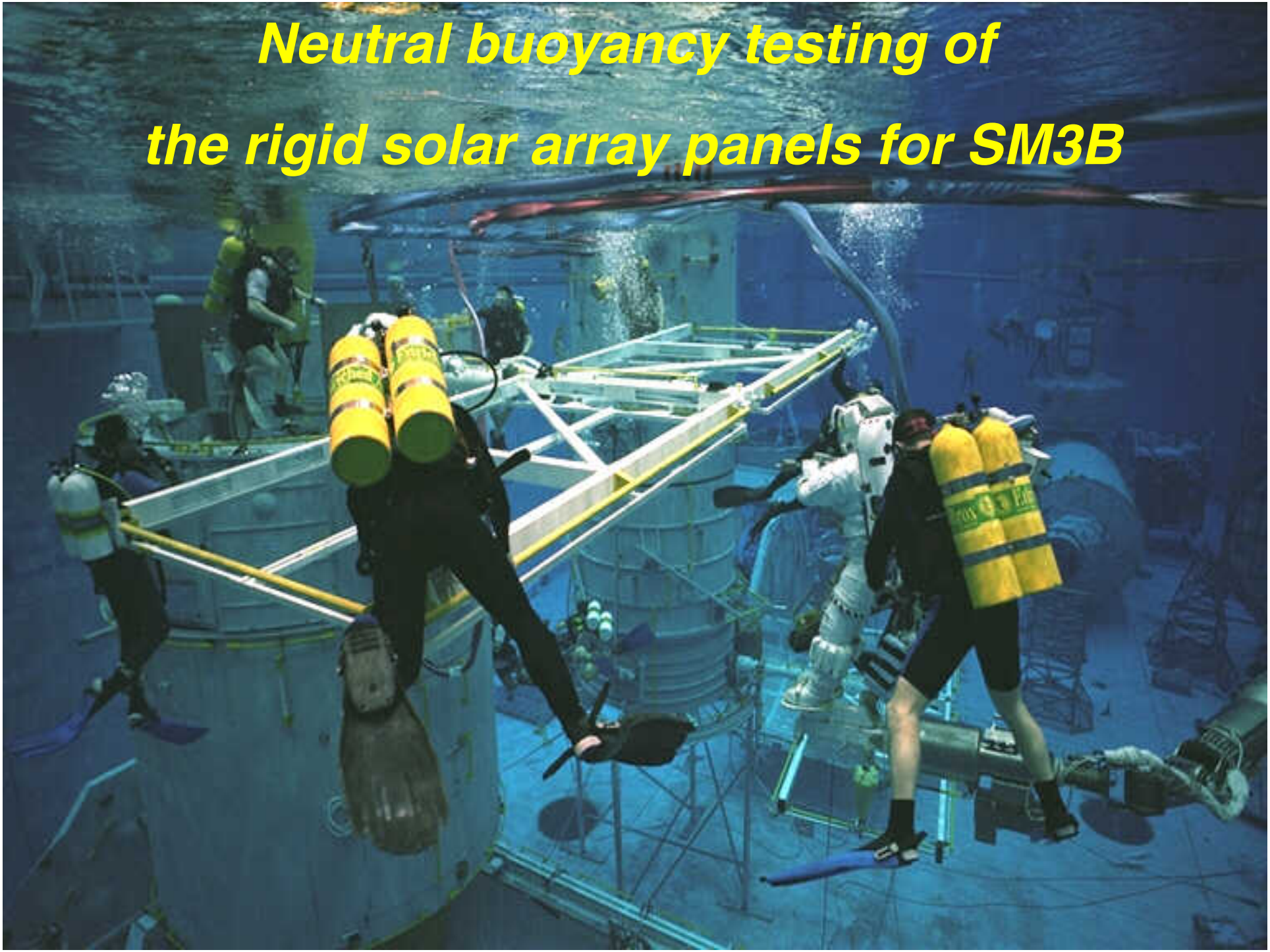


Advanced Camera for Surveys (ACS)



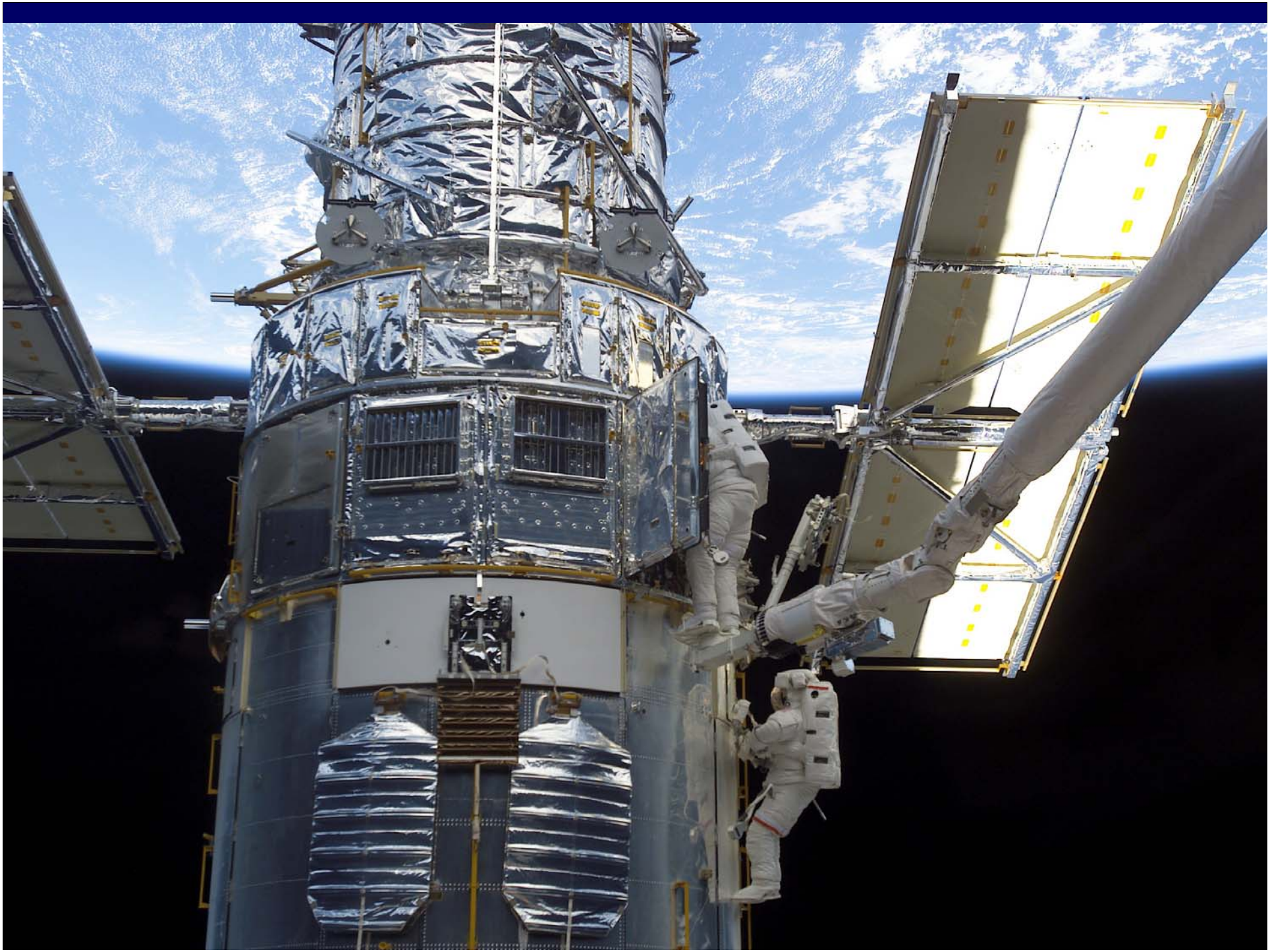
Scientific Instrument Replacement

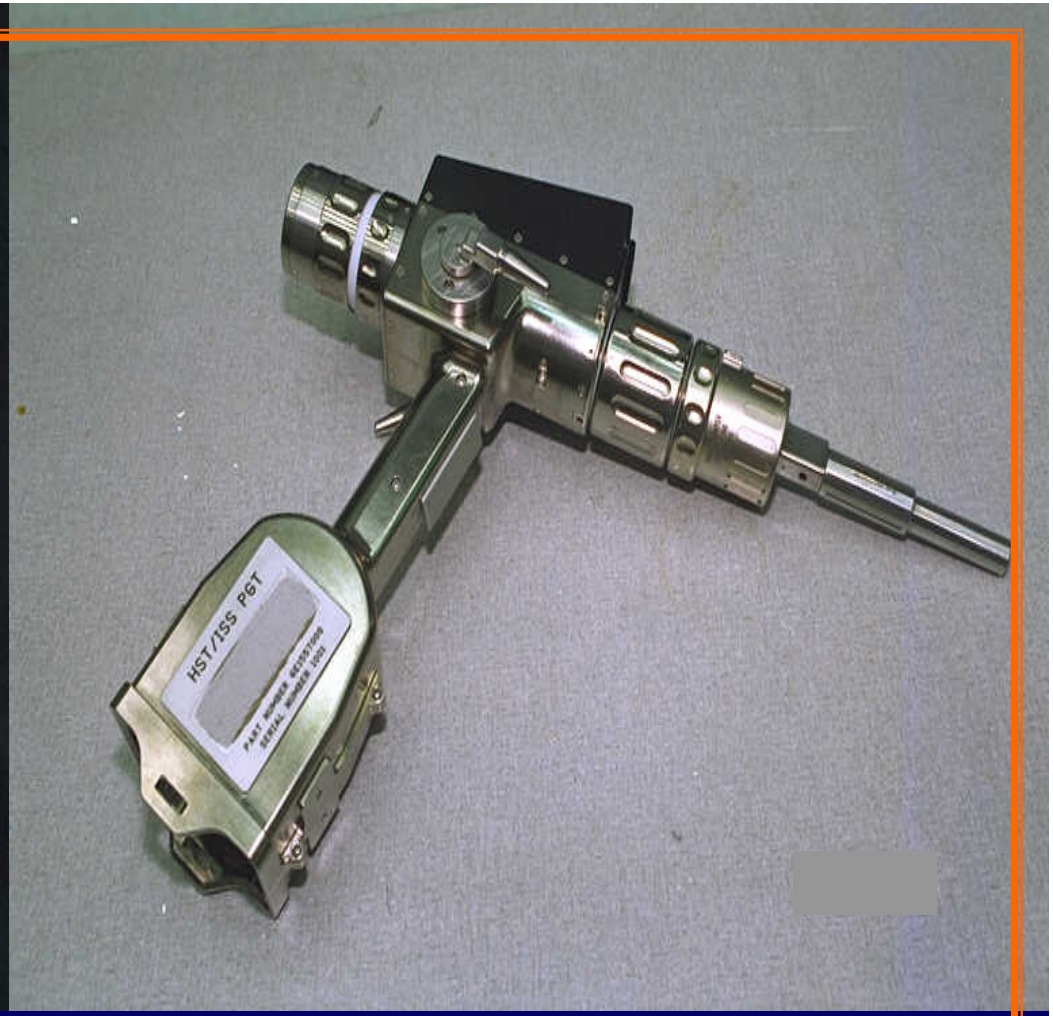



Neutral buoyancy testing of
the rigid solar array panels for SM3B

HST Servicing Mission 3B: -V2 Solar Array III installation on EVA Day 1

Power Control Unit (PCU) Trainer for SM3B





#4

EVOLVE

Hardware and procedure concepts → *Final designs for flight*

Part-task neutral buoyancy tests → *Final end-to-end task choreographies*

Engineering development → *Formal crew training*

Rough timeline estimates → *Final expected EVA task times*

#3

TEST, TEST … AND RETEST.
TRAIN, TRAIN … AND RETRAIN.

#2

VERIFY FLIGHT HARDWARE, INTERFACES, AND PROCEDURES

..AND THE

#1 LESSON LEARNED

FOR RISK MANAGEMENT

IS…


#1
… APPLY THOSE
LESSONS LEARNED
FROM THE PAST